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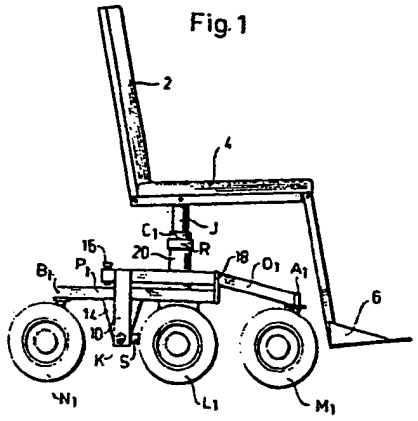
(54) **Wheeled chassis.**

(57) A manoeuverable, motor-driven wheeled chassis includes a chassis structure carrying two pairs of support wheels (N_1, M_1) separated in the longitudinal direction of the chassis. Between the pairs of support wheels there is a pair of drive wheels (L_1). The chassis structure includes a first frame structure (P_1, 14) carrying a first pair of support wheels (N_1) and the pair of drive wheels (L_1), and a second frame structure (O_1, 10) carrying the second pair of support wheels (M_1) and vertically pivotably connected to the first frame structure (at K).

The wheeled chassis is primarily intended for use as a wheelchair (2,4,6).

Fig. 1



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Wheeled chassis

The present invention relates to a manoeuvrable, motor-driven wheeled chassis, including a frame structure carrying two pairs of freely journalled support wheels separated in the longitudinal direction of the chassis, between said wheels there being arranged a pair of drive wheels.

The invention thus relates to a motor-driven wheeled chassis for vehicles of different kinds, e.g. wheelchairs, wheeled beds, trucks etc. In the following, the invention will be described primarily in relation to wheelchair applications.

The main object of the present invention is to provide a wheeled chassis which moves very flexably over irregularities in the substructure on which it travels, e.g. thresholds when used indoors, and stones or other ground irregularities when used outdoors, the vehicle itself only executing insignificant movements vertically.

A further object of the invention is to provide a chassis with six wheels which are turnable substantially about one vertical axis.

These objects are achieved with a wheeled chassis of the kind described in the introduction and characterized in that the chassis structure includes a first frame structure carrying a first pair of support wheels and the pair of drive wheels, and a second frame structure pivotably connected to the first structure in the vertical direction, and carrying the second pair of support wheels.

In accordance with a more developed embodiment of the invention, the wheeled chassis is implemented such that the wheels in one support wheel pair are vertically movable, independent of each other. The ability of the chassis to move over an irregular substructure is thus further improved, without the movement over these irregularities, being transmitted to the part of the vehicle supported by the chassis.

A wheeled chassis is thus provided by the invention, e.g. in applications for wheelchairs, such that by its flexability it has the ability of assimilating to an essential degree the irregularities in the substructure, so that these do not give rise to shaking or other uncomfortable tipping movements in the chair itself, whereby comfort is improved. Although the wheeled chassis has this flexability it has at the same time the necessary stiffness for providing the chassis with the required rigidity.

According t a still further advantageous embodiment f the inventive wheeled chassis, the longitudinal members of the second frame structure have set screws for adjusting the maximum permitted movement of these members relative the first frame structure. These set screws are adjusted to the maximum permitted movement of the longitudinal members of the second frame structure, e.g. to the height of thresholds in the premises where the chassis is to be used. When applied to a wheelchair, this maximum permitted movement namely determines the size of the forward or backward tipping movement which can be carried out by the chair itself, and thus it is a considerable advantage to be able to limit the size of this movement to the actual need.

An embodiment of the wheeled chassis in accordance with the invention, applied to a wheelchair, will now be described in detail as an example, with reference to the appended drawings, on which

Figure 1 is a side view of a wheelchair with the wheeled chassis in accordance with the invention,

Figure 2 illustrates the embodiment in Figure 1 to a larger scale and with the chair itself removed,

Figure 3 is a plan of the embodiment illustrated in Figure 2 and seen from above,

Figure 4 is a section along the line A-A in Figure 1,

Figure 5 is a section along the line B-B in Figure 3 and Figure 6 is an end view of the wheeled chassis seen from the left in Figure 5.

A wheelchair with a wheeled chassis in accordance with the invention is illustrated in Figure 1. The chair itself comprises a back support 2, a seat pad 4 and a foot rest 6. The chair itself is carried by a tubular chair fastening J which is attached to a transverse member R at C_1. The member R is in turn carried by the chassis structure, as will be described in detail below.

The wheeled chassis includes a chassis structure with a support wheel M_1, M_2, N_1, N_2 arranged at each corner.

The support wheels M_1, M_2, N_1, N_2 are of the rotatable castor type, carried by an attachment means 8, which is attached to the chassis structure freely swivelable about a vertical axis at A_1, A_2, B_1, B_2. As will be seen from Figures 1-5, the journalling point for swiveling the attachment means, 8 is displaced in relation to the rotational axis of the wheels M_1, M_2, N_1, N_2.

A pair of drive wheels L_1, L_2 is arranged between the support wheels M_1, M_2, N_1, N_2. The drive wheels L_1, L_2 are non-swivelably attached to the chassis structure in a way which will be described in detail below.

The chassis structure itself includes two frame structures.

The first frame structure comprises two longitudinal members P_1, P_2, each carrying a support wheel and a drive wheel N_1, L_1 and N_2, L_2, respectively.

The second frame structure similarly includes two parallel, longitudinal members O_1, O_2 carrying support wheels M_1 and M_2 at their ends.

The longitudinal members O_1 and O_2 are arranged to be partially immediately above a portion of the longitudinal members P_1 and P_2, respectively, of the first frame structure, and at the end portion of the respective longitudinal member O_1, O_2 opposite to the end carrying the support wheels M_1, M_2 there are attached two dependent side members 10 and 12. A similarly dependent side member 14 is attached to each of the longitudinal members P_1 and P_2 of the first frame structure between the support wheels N_1, N_2 and the drive wheels L_1, L_2. When the chassis structure is assembled, the pair of side members 10, 12, of the longitudinal members O_1, O_2 is mounted on either side of the side members 14 of the longitudinal members P_1, P_2 and pivotably connected at the lower ends of the side members with the aid of a through shaft K. The longitudinal members O_1, O_2 are thus pivotable in the vertical direction relative to the longitudinal members P_1, P_2 about this shaft K, so that the ends of the members O_1, O_2 carrying the support wheels M_1 and M_2 can rise when the support wheel in question moves over a projection n the substructure. The amount of pivoting is determinable by a set screw 16 arranged at the side members 10, 12 on the longitudinal members O_1, O_2. The maximum permitted pivoting of the longitudinal members O_1, O_2 should be adjusted so that it is not greater than necessary, since it would otherwise enable an unnecessarily large backward or forward rocking movement of the chair itself.

For controlling the vertical turn of the members O_1, O_2 each of said members extends between two guide pins 18 which are vertically arranged at one end of the members P_1, P_2. The longitudinal members O_1, O_2 are angled at the location of this guidance to compensate for

placing these members above the longitudinal members P_1, P_2 of the first frame structure, s that all wheels are normally substantially at the same level.

The shaft arrangement connecting both frame structures includes a tube T in which there runs a shaft K mounted in a glide bearing, so that the longitudinal members P_1, O_1 on one side of the chassis structure have some movability relative the longitudinal members P_2, O_2 on the other side of the structure, thus providing flexability to the chassis structure as a whole.

Attachments 20 for the transverse member R are arranged on the longitudinal members O_1, O_2. As will be seen best from Figure 2, each of these two attachments comprises a cylindrical rubber body 22 attached to one of the longitudinal members O_1 or O_2 at one end, its other end being attached to the transverse member R. The rubber body 22 is surrounded by ametal sleeve 24 attached to one of the members O_1, O_2. There is thus obtained a flexible attachment of the transverse member R to the longitudinal members O_1 and O_2, which enables some relative vertical movement between the members O_1 and O_2. The metal sleeve 24 allows the rubber body to yield solely in the axial direction of the body but not laterally, which is of decisive importance for attaching the chair to the transverse member R while obtaining the necessary stability of the chair.

There is a fastening J for the chair at the centre of the member R. This fastening J is tubular and attached to the member R, extending through said member and a distance below it, its bottom portion pivotably connected to the end H of a link 26, the other end G of which is pivotably connected to a transverse support member S, see Figures 3 and 4. The support member S is hollow with a rectangular cross section, as will be seen in Figures 4 and 5. The ends of the member S are pivotably connected to one end E_1, E_2 of links 28, the other ends F_1 and F_2, respectively, being pivotably connected to fastenings rigidly attached to the housings of drive motors U_1 and U_2. To keep the support member S in position, it is formed with a fork D engaging round the tube T, see Figures 3-6. The support member S is thus prevented from pivoting downwards and serves to effectively steady the seat fastening J so that the necessary stability is obtained for the seat itself.

Drive means in the form of two driv motors U_1, U_2 are arranged on either side of the chassis structure close to the drive wheels L_1, L_2. The drive motors are attached to the longitudinal members P_1 and P_2 of the first frame structure. The drive motors U_1, U_2 are suitably electric motors driven by batteries (not shown), similarly carried by the frame structure. The motors are adapted such that they can either drive both drive wheels L_1, L_2 in the same direction, forwards or backwards, for driving the chair straight forwards or straight backwards, or the wheels can be driven in opposite directions for turning the wheelchair substantially about a vertical axis, thereby enabling the wheelchair to turn in either direction.

A drive means (not shown) can similarly be arranged to raise or lower the seat fastening J for altering the height of the chair.

As will be apparent from the above description of an embodiment, the wheeled chassis in accordance with the invention includes a plurality of articulations having a certain amount of movement also in other directions than the direction of turning or pivoting, so that the chassis obtains smooth flexibility. To advantage these articulations can comprise ball and socket joints.

CLAIMS

1. A manoeuverable, motor-driven wheeled chassis, including a chassis structure carrying pairs of freely mounted support wheels separated in the longitudinal direction of the chassis, and a pair of drive wheels arranged between the support wheels, c h a r a c t e r i z e d in that the chassis structure includes a first frame structure carrying a first pair of support wheels and the pair of drive wheels, and a second frame structure pivotably connected to the first structure in the vertical direction, and carrying the second pair of support wheels.

2. Chassis as claimed in claim 1, c h a r a c t e r i z e d in that the first frame structure includes two parallel mutually movably connected longitudinal members and in that the second frame structure similarly includes two parallel, mutually movably connected longitudinal members, connected at their ends to the first frame structure such that they are individually pivotable relative to it.

3. Chassis as claimed in claim 1 or 2, c h a r a c t e r i z e d in that the longitudinal members of the second frame structure are at their ends connected to the first frame structure by a transverse shaft structure, which is movably attached to side members rigidly connected to the longitudinal members of the frame structures, the longitudinal members of the second frame structure being pivotable relative the first frame structure about said shaft structure.

4. Chassis as claimed in any of claims 1 through 3, c h a r a c - t e r i z e d in that each of the longitudinal members of the first frame structure constitutes a single straight member, while each of the longitudinal members of the second frame is formed by two straight portions forming an obtuse angle to each other, one portion being arranged above the corresponding longitudinal member of the first frame structure, and normally extending substantially parallel thereto, while the other portion of the member slopes downwards towards the substructure to keep the supp rt wheel carried by the end of the member at substantially the same level as remaining wheels, the portion of the members of the second frame structure arranged above the longitudinal members of the first frame structure, having at their end portions two dependent side members extending on either side f similarly dependent side members attached to the longitudinal members of the first frame structure, between the first pair of support wheels and the drive wh els, said shaft structure extending thr ugh said side members.

5. Chassis as claimed in claim 3 r 4, c h a r a c t e r i z e d in that the shaft structure includes a tube, inside which a shaft arranged in a glide bearing extends, for pivotable fixation of the longitudinal members relative each other, and for pivotable connection of the second frame structure to the first frame structure.

6. Chassis as claimed in claim 4 or 5, c h a r a c t e r i z e d in that the longitudinal members of the second frame structure are guided between a pair of vertical guide pins upstanding from the longitudinal members of the first frame structure.

7. Chassis as claimed in any of the claims 4 through 6, c h a r a c t e r i z e d in that the longitudinal members of the second frame structure have set screws for adjusting the maximum amount of pivoting about the shaft structure relative the first frame structure.

8. Chassis as claimed in any of the claims 1 through 7, c h a r a c t e r i z e d in that means for driving the drive wheels are carried by the first frame structure and adapted such that the two drive wheels are drivable in the same direction, forwards or backwards, or in opposite directions for swiveling the chassis substantially about a vertical axis to enable optional alteration of the travelling direction of the vehicle.

9. Chassis as claimed in any of the claims 1 through 8, intended for a wheelchair, c h a r a c t e r i z e d in that a transverse member extends between the longitudinal members of the second frame structure for carrying a chair seat, said member being pivotably mounted on the longitudinal members of the second frame structure.

10. Chassis as claimed in claim 9, c h a r a c t e r i z e d in that the chair seat is carried by a tubular seat fastening attached to the transverse member, and extending therethrough, the lower portion of said tubular fastening being pivotably connected to a transverse support member pivotably connected to the longitudinal members of the first frame structure for preventing the chair from tipping forwards or backwards.

11. Chassis as claimed in claim 10, c h a r a c t e r i z e d in that the support member is arranged such that, with the aid of the shaft structure, it is prevented from displacement.

12. Chassis as claimed in any f claims 9 thr ugh 11, c h a r a c - t e r i z e d in that the transverse seat support member is attached t each of the longitudinal members of the second frame structure by means including a rubber body attached at one end to the transverse member and at its other end to the longitudinal member, said body being surrounded by a metal sleeve attached to the longitudinal member to enable relative movement between the second frame structure and the transverse member solely in the axial direction of the rubber body.

Fig. 1

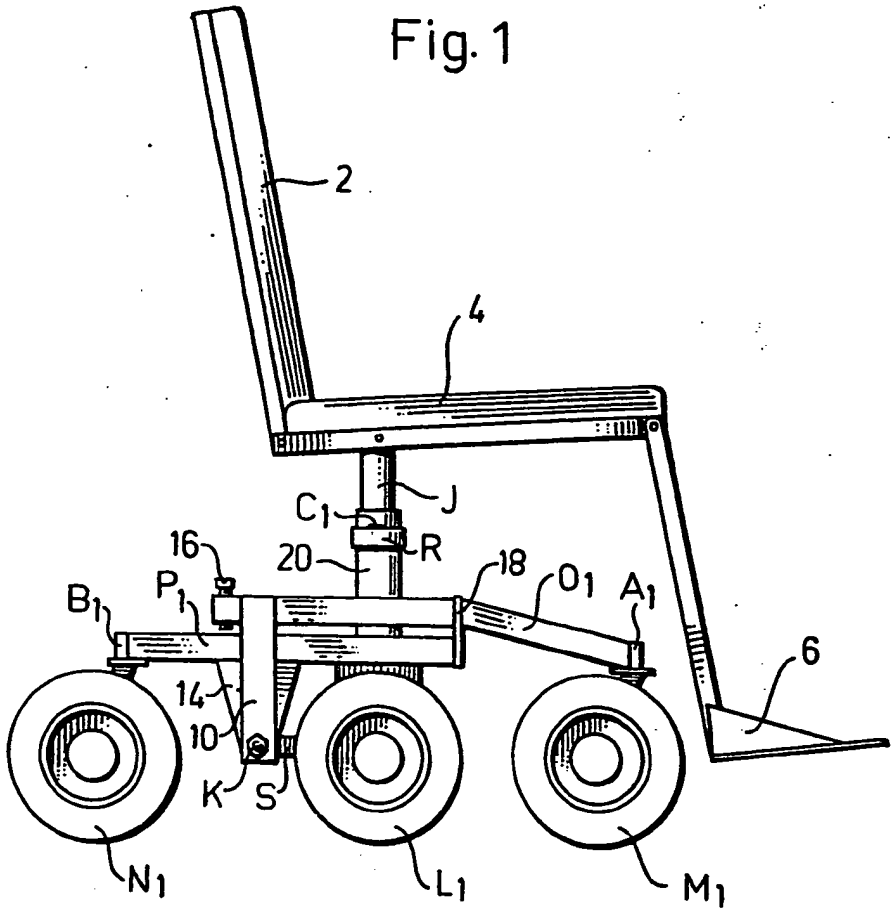
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Fig. 2

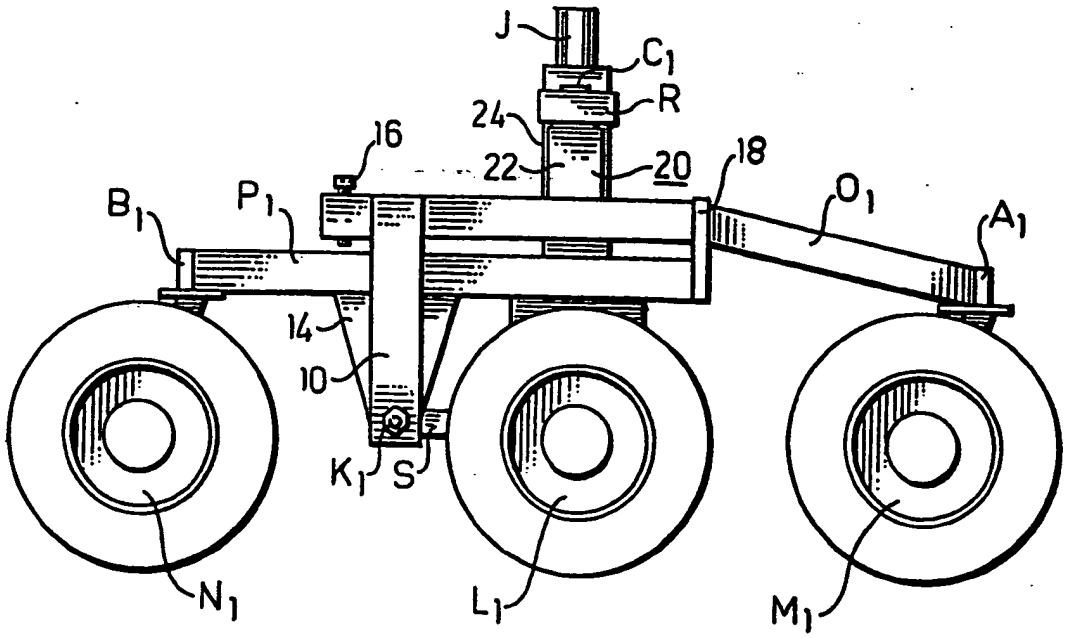
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Fig. 3

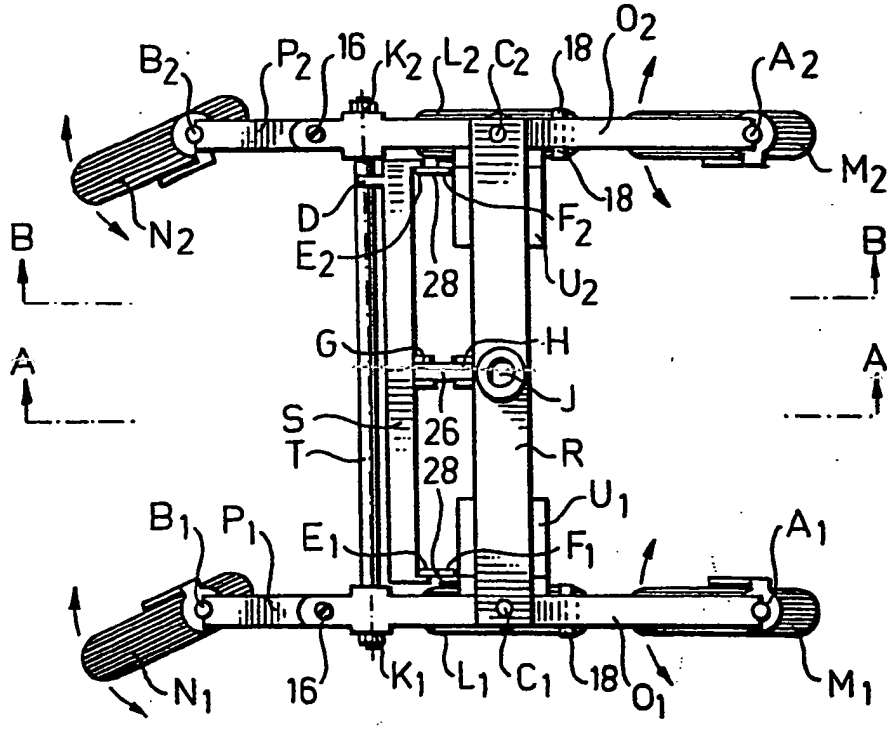
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Fig. 4

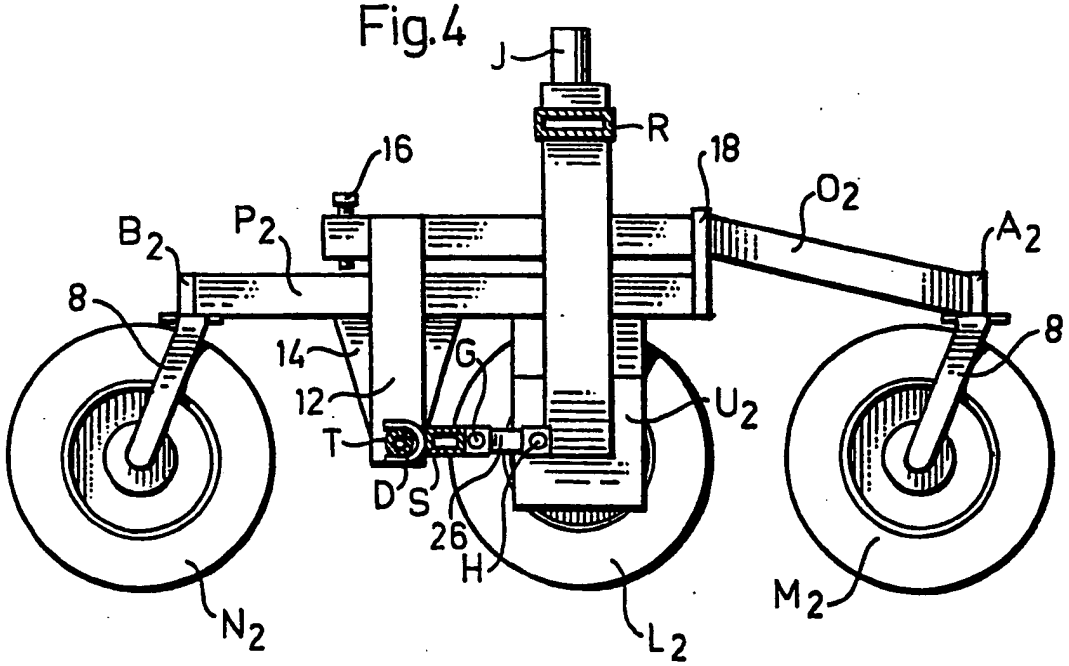
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Fig. 5

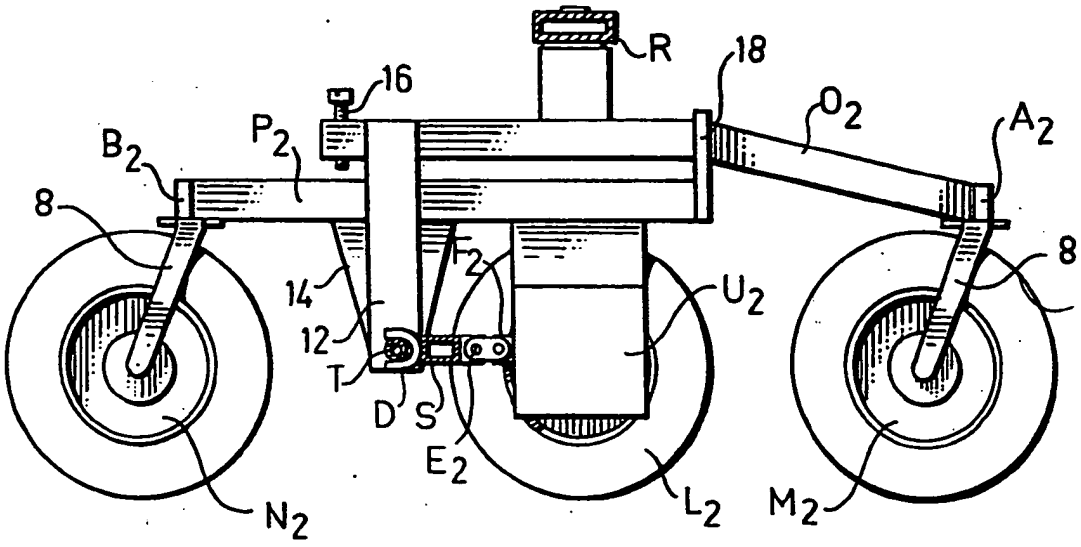
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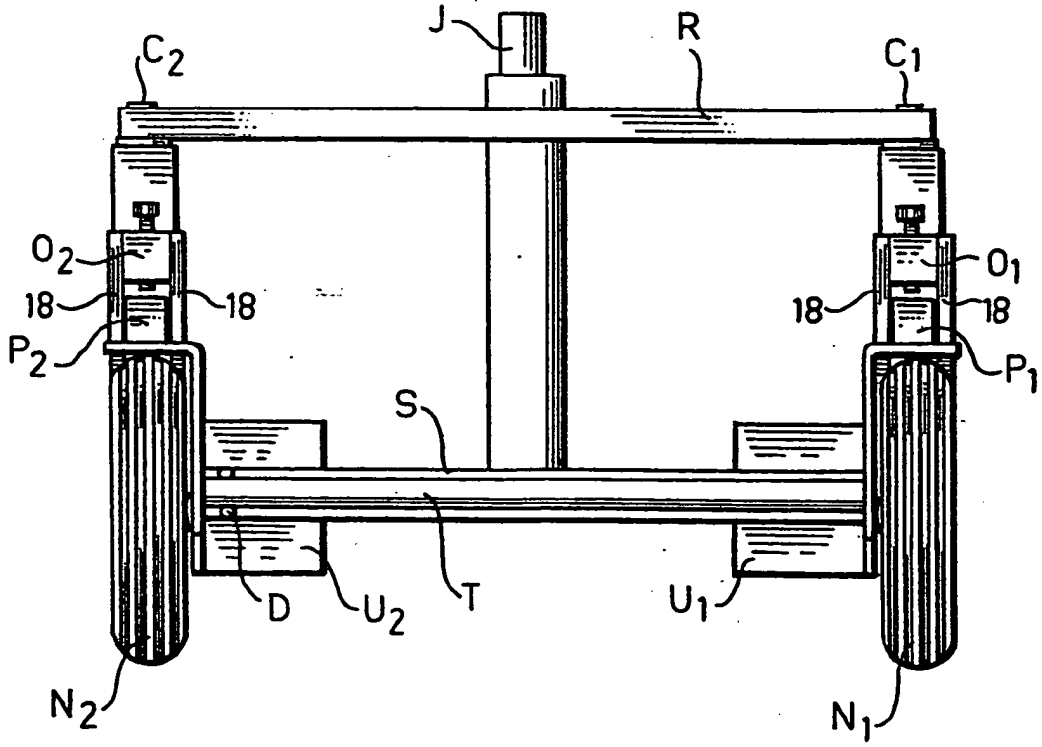
Fig. 6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